

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

SESSION 1D

ECOLOGY AND EVOLUTION

Session Moderator: Bonnie Becker, Interdisciplinary Arts & Sciences (Tacoma Campus)

MGH 234

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Influence of El Niño on Nutrients and Anaerobic Processes in the Eastern Tropical North Pacific

Anna Cassandra (Anna) Bakker, Senior, Oceanography

Mary Gates Scholar

Mentor: Rick Keil, Oceanography

Mentor: Jacob Cram, Oceanography

El Niño and La Niña are large-scale ocean-atmosphere phenomena that originate in the equatorial Pacific Ocean and last on scales of months to years. In addition to driving the global climate, the El Niño-Southern Oscillation (ENSO) also influences local-scale activities such as oceanic nutrient concentrations and microbial processes. The location where ENSO temperature oscillations originates is upstream of the world's largest, naturally occurring oxygen deficient zone (ODZ), implying that ENSO temporal variations could impact ODZ dynamics. With very little to no oxygen in these waters, microbes use nitrogen species for anaerobic processes, denitrification and anaerobic ammonium oxidation (anammox), in lieu of oxygen. These microbial processes identify by their chemical markers: nitrate, nitrite, and ammonium. This project was to examine ENSO-driven changes in both the vertical extent of oxygen deficient waters and nutrient concentrations in the Eastern Tropical North Pacific (ETNP) off the coast of Manzanillo, Colima, Mexico. In addition to data from 1965, 1969, 1972, 1994, 2007 and 2012 to the ETNP, I collected seawater samples from December 2016 to January 2017 aboard the R/V Sikuliaq to compare oxygen and nutrient profiles over the past 50 years. I hypothesized that ENSO influences fluctuations in oxygen, nutrient, and microbial process regimes. Nutrient data was compared to the global ENSO and oceanographic state during the preceding and following years of each cruise to examine possible relationships between the variables. Rates of denitrification and anammox were also calculated to see if anaerobic processes also correspond with the ENSO cycle. This project

provides insight on the microbial and oceanographic response to ENSO dynamics in an economically and ecologically critical part of the ocean. El Niño and La Niña are modules of the global climate, which are becoming stronger and more frequent in response to anthropogenic climate forcing.

SESSION 1I

MCNAIR SESSION - EXPLORING SCIENCE FROM CELLS TO EXOPLANETS

Session Moderator: Janneke Hille Ris Lambers, Biology

MGH 254

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Mapping Exoplanets Using Time Variability

Guadalupe (Lupita) Tovar, Senior, Astronomy

NASA Space Grant Scholar, McNair Scholar

Mentor: Victoria Meadows, Astronomy

Mentor: Jacob Lustig-Yaeger, Astronomy

With over 2,000 new discoveries the field of exoplanets is rapidly expanding. As the detection of new planets continues to increase, many seek to answer: What do these distant exoplanets look like? Current telescopes are not yet able to image the surfaces of exoplanets, but plans are underway for a future NASA telescope that will be capable of observing light reflected off terrestrial exoplanets using a coronagraph instrument to block out the starlight. Located at distances of many light years, these planets only appear as dots of light. Using the Virtual Planetary Laboratory's (VPL) 3D Spectral Earth model, light reflected off the many unique surfaces and clouds on Earth were modeled and compressed into a single spatially-unresolved dot. By observing how the brightness of the planet changes as it rotates on its axis we were able to see different surfaces reflecting more or less light. A coronagraph-equipped telescope noise model was used to apply realistic observational noise to the spectra from the VPL 3D Spectral Earth Model. This allowed us to simulate data a future telescope would be capable of observing. After producing the data, periodograms were used to infer the planetary rotation rate, and Principal Component Analysis (PCA) helped us recognize how many unique surfaces an exoplanet

has and approximately what color each surface is. Following the PCA, a more sophisticated surface mapping algorithm called the Surface Albedo Mapping Using Rotational Inversion (SAMURAI) model was used to derive the underlying planetary surface covering fractions and their respective wavelength-dependent albedos that give rise to the time-dependent data that we observe. We show that many plausible configurations for the next-generation NASA telescope will be capable of mapping the area distributions and colors of oceans, land, and even vegetation, should these surfaces exist on any nearby exoplanets.

SESSION 1R

COMPUTER SCIENCE: DISTRIBUTED SYSTEMS, VERIFICATION, SECURITY AND HCI

Session Moderator: Kurtis Heimerl, Computer Science and Engineering

JHN 111

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Drunk User Interfaces: Using Smartphone-Based Human Performance Tests to Detect Inebriation

Sayna Parsi, Senior, Linguistics, Informatics

Mary Gates Scholar

Mentor: Jacob Wobbrock, The Information School

The standard quantitative method for assessing inebriation is to use a breathalyzer. However, breathalyzers are primarily owned by law enforcement and used only after a drunk individual is caught behind the wheel. Unlike breathalyzers, smartphones are one of the most ubiquitous technologies in today's society. If smartphones could be used to reliably detect inebriation, they could be employed in ways to prevent drunk driving (e.g., by linking the smartphone to the car) or to incent good behavior (e.g., by lowering insurance for those who pass an app-based test before driving after 10 pm). We are running an ongoing study to examine whether or not challenging human performance tasks (e.g., typing, swiping, reacting) can be implemented on the smartphone to detect inebriation and prevent drunk individuals from getting behind the wheel. These tasks not only assess drunkenness from a performance perspective, but also from the perspective of the smartphone sensors.

POSTER SESSION 3

Commons West, Easel 3

2:30 PM to 4:00 PM

The Effects of Visual Presentation on Perceived Veracity of Unfamiliar News Sources

Anya Kim (Any) Hsu, Senior, Informatics

Michael Magee, Senior, Informatics

Marijn Burger, Senior, Computer Science & Software Engineering

Mentor: Jacob Wobbrock, The Information School

In online news, as in many forms of online and print media, the *appearance* of the content can influence the reader, perhaps even more than the content itself. Styling is chosen to make certain news sources look modern, traditional, or edgy, and these styling choices might affect readers' judgments. At the same time, creating and hosting websites that anyone can access has never been easier than it is today, as seen in the explosion of fake news across social media outlets during the 2016 U.S. presidential election. On a daily basis, people shared misleading or false articles because those articles looked convincing and affirmed the biases of their readers. Certainly the content, timing, design, and layout of news articles might all contribute to their propagation across social media, but the relative import of each of these factors is still unknown. In this work, we are interested in how the appearance of news, *independent of its content*, influences consumers' perceptions of an article's veracity. Our research project examined how the presence of certain visual attributes (e.g., layout, links, fonts, and use and arrangement of photos and videos) in news articles affects people's credibility judgments of unfamiliar news sources. We conducted an online experiment and semi-structured interviews to collect data from people currently attending universities. We showed them a series of content-neutral (i.e., "lorem ipsum") news articles and asked them to rate the credibility of each one on a 1-7 Likert scale. We also provided opportunities for narrative responses for more in-depth opinions at the end of the study. Our results indicate that presentational aspects do indeed affect perceived veracity of online news sources. Designers can take these findings into account when seeking to communicate better with their users.

POSTER SESSION 4

Commons West, Easel 4

4:00 PM to 6:00 PM

Macroscopic Analysis of Indigenous, Iron Age Pottery Sherds

Beatrice Clara (Beatrice) Dornfeld, Junior, Anthropology: Archaeological Sciences

Mentor: Marcos Llobera, Anthropology

Mentor: Jacob Deppen

My project focuses on macroscopic analysis of indigenous pottery from the Iron Age in Mallorca, Spain. My first goal is to develop an efficient method of analysis that can be used with large samples of pottery collected in the Landscape, En-

counters and Identity Archaeology Project. I am recording a number of traits for individual ceramic pieces, such as color, texture, and temper. For each of these traits, I am evaluating the replicability, speed, and amount and types of tools needed to record them. My second goal is to use this information to understand the variability within indigenous pottery. Traditionally, this pottery has been divided into two types based off of fairly rigid criterion, which masks the potential variability within each type. This method of analysis, along with multivariate statistical analysis of the data collected, will help to characterize the variation within each type in order to better understand indigenous pottery production techniques.